California Science Consortium: A Glendale Community College University of California, Los Angeles (UCLA) Program

Project staff established a community college network designed to keep science faculty abreast of the latest in teaching techniques, laboratory facilities and curricular needs of students to prepare them for transfer to senior institutions and ultimately the workplace. The project focused on improving teaching strategies for transfer education in biological and physical laboratory sciences in California community colleges and effecting changes in the relationship among science departments of the community college and UC system.

This consortium effort addressed the need for access of underrepresented groups (age, gender, ethnicity, race and employment status) to science majors, means for sharing strategies for nontraditional forms of instruction that provide access, maintain standards and stimulate student interest, opportunities for shared community college-university faculty research projects to enrich classroom teaching, recruitment of science majors a future science faculty and the importance of subject area-intensive faculty development activities.
California Science Consortium: A Glendale Community College and UCLA Program

The proposed project uses staff development and research techniques to improve transfer education in the natural (biological and physical) sciences in California's community colleges and to effect change in the relationships among the science departments of all 106 community colleges and the University of California (UC) system. The proposal addresses four of the Fund's original five activities and focuses on improving science transfer instruction through use of various AB 1725, AB 1173, and 1989-90 Basic Agenda Criteria. Glendale Community College (GCC) is a leader in community college faculty development and research and shares other partnerships with UCLA that benefit students. The two will work together to develop a state- and system-wide science consortium that will develop partnerships and programs to improve teaching abilities of faculty members, address special learning needs of educationally disadvantaged students, provide educational services for new clientele (including older, working adults), and improve traditional instruction programs. The project will be responsive to race, ethnicity, gender, age, and employment status of nontraditional students to provide access to majors programs that will encourage students to seek professional careers in science. Partnerships will serve as foundations for future collaborative student bridge activities and intersegmental faculty research programs.

Specific problems to be addressed are the needs for (1) access of underrepresented groups to science majors programs; (2) means for sharing strategies for nontraditional forms of instruction that provide access, maintain standards, and stimulate student interest; (3) opportunities for shared community college-university faculty research projects to enhance and enrich classroom teaching and for summer and other bridge programs to ease student transition to university life; (4) recruitment of science majors as future science faculty; and (5) subject-area intensive (biological and physical sciences) faculty development activities that connect and relate intra-segmental community college science instruction programs. Major benefits will accrue to all science students and faculty in the two-year system.

Project staff will develop a network designed to keep science faculty abreast of the latest in teaching techniques, laboratory facilities, and curricular needs of students to prepare them for senior institution and, ultimately the work place. Based on their research, project staff will administer complementary surveys to representative community college and UC science faculty and will solicit exemplary, innovative science programs that combine access and transfer capabilities. Ongoing evaluation of activities will help in the planning of a state-wide
spring conference at UCLA, which will provide access to laboratories and equipment for demonstration of exemplary programs and bring together participants from both segments. Participants will complete detailed evaluations of the model programs and the conference activities, and analyses of these data will guide the project staff in preparing the follow-on bridge and research programs.

The small project team includes three faculty members from GCC and two contract consultants from UCLA. The UCLA staff will arrange the partnerships and lay the groundwork for the follow-on program. The budget includes substantial funding to ensure state-wide community college participation at the spring conference. GCC will provide 23% of the costs of the project. Of special note is a GCC science, technology, and ethics lecture series planned to coincide with the project activities.

Expected outcomes are an improved climate for collaborative teaching and learning, broad dissemination of teaching innovations, and new approaches to aid the non-traditional student in traditional majors courses.
California Science Consortium: A Glendale Community College and UCLA Program

1. Specific Educational Program Being Addressed

This proposal addresses four of the Fund's original five activities: (1) programs for improving teaching abilities of faculty members, (2) programs addressing special learning needs of educationally disadvantaged students, (3) educational services for new clientele, including older, working adults, and (4) efforts to improve traditional instructional programs. The proposed project uses staff development activities to improve teaching ability and transfer education in the natural sciences in California's community colleges and to effect change in the relationships between the science departments of the community colleges and those of the University of California (UC) system. The project focuses on improving instruction in the biological and physical science programs through use of various AB 1725, AB 1173, and 1989-90 Basic Agenda Criteria. Glendale Community College (GCC) and University of California, Los Angeles (UCLA) will work together to establish a community college-UC Science Partnership that will benefit two-year institutions throughout the state. GCC and UCLA share other partnerships, such as the Transfer Alliance Program (TAP), and are currently negotiating the possibility of offering a joint Associate in Arts Degree.

Nearly 50 percent of all post-secondary students have their first science experience in the community colleges, which enroll 52% of all students and 42% of minority students in higher education. After satisfying general education requirements, too few students continue in science. However, because 42% of the nation's minority students choose the community college to begin their education, two-year institutions have an unparalleled opportunity to attract, retain, and transfer underrepresented clientele (students whose race, gender, age, and ethnicity are representative of the overall student population) as science majors and later to recruit these scientists to the teaching profession. Although the community college transfer rate to the CSU system is quite respectable, the importance of establishing a direct "pipeline" from the A.A. to the Ph.D. cannot be overstated. Statistics show that minority students who transfer
directly to the U.C. system as juniors have a much better chance of completing advanced
degrees.

Within the next 10 years, 15% of the new work-force will be white male, 42% will be white
female, and the remainder will be from traditional minority populations. Today, the majority of
employed scientists are white male. This fact, coupled with an ever increasing need for trained
scientists and technicians for industry and education, magnifies the need to develop an
effective strategy to link the community colleges and the UC system in a complementary
endeavor to encourage science majors and develop faculty expertise.

Glendale has strong transfer programs in the biological and physical sciences and a model
staff development program. GCC recognizes the important role of the two-year institutions in
providing access to future scientists recruited from increasingly diverse populations. Since
community colleges offer course work ranging from remedial to transfer, they provide an
important transition between secondary and four-year institutions and offer educational
opportunities for students of widely varied abilities and economic backgrounds who might
otherwise be unable to earn baccalaureate degrees. As a result, community colleges are in an
excellent position to influence students to become future scientific leaders and educators. If
non-traditional students are to progress smoothly from introductory to highly advanced
scientific knowledge in the biological and physical sciences, the community college and the
UC system must establish partnerships that will serve as foundations for future collaborative
bridge and faculty research programs.
Specific Problems Addressed

The problems addressed by this proposal are drawn from all three broad areas (AB 1173 Projects, AB 1725 Projects, and the Board of Governors' 1989-90 Basic Agenda Projects) defining scope criteria. GCC science faculty believe that these problems affect science education in most of the 106 community colleges in California and that the proposed solutions will benefit faculty and students throughout the state. The California Science Consortium will direct its efforts toward resolving the following problems:

Problem 1: How can community colleges provide access for and attract science majors from underrepresented groups—the educationally disadvantaged; new clientele, including older, working adults; women; and minorities?

The nature of science education requires laboratories, time intensive instruction, and a method by which instructors can keep abreast of the rapidly changing technology. The topics are experimental and observational by nature. As such, they attract some of the most capable faculty and brightest students. Indeed, according to James D. Watkins, Secretary of Energy, "the traditional approach to science education continues to focus primarily on the top 10 percent of our students—the ones who, in general, will make it anyway" (May 1989). This fact, however, is also one of the main reasons for the decline in quality. We have, by and large, not maintained a committed and continued scientific funding within our two-year colleges to accommodate change, growth, and student diversity in gender, ethnicity, race, economics, and age. As Watkins observes, "we cannot continue to place our primary emphasis only on the top few percent. We must begin a new effort to target that middle strata of students because they, along with women and minorities, will make upon almost 80 percent of our emerging workforce."

As an example, although GCC's transfer rate in the natural sciences has actually increased slightly over the past few years, the transfer student profile does not reflect the college's population. In fact, some science courses have experienced severe retention and success difficulties because students are unable to satisfy established transfer standards. In General Physics 105, the dropout rate and grades of D and F increased 13% between 1982 and 1987; in General Physical Science 131, the increase was 17%. These figures show a clear relationship to GCC's rapidly changing student population. Between 1976 and 1987, the district's Caucasian population (not including Armenians) decreased from 78% to 42%, while Latinos increased from 9 to 16%, Armenians from 3 to 16%, and Asians from 4.196 to 12.1%, as shown in Figure 1. Thus, at least 40% of the community are ethnic minorities and recent immigrants, frequently underpre pared, who are using the college as an entrance to higher education.

[BAR GRAPH DELETED HERE --- FIGURE 1. (Ethnic Percentages of Student Body)]
Figure 2 shows the 1988 distribution of ethnic and immigrant students. Almost 40% of GCC's total enrollment is now in remedial and ESL classes; in fact, ESL is now the largest college department, which reflects an increase in non-native English speaking clientele in the total enrollment from 20%.

[PIE CHART OF ---- DELETED HERE --- FIGURE 2 (1988 Distribution of Ethnic and Immigrant Students)]

[BAR GRAPH DELETED HERE --- FIGURE 3 (Change in Enrollment by Gender)]

in 1980 to 57% in 1989. Figure 3 shows the number of women students increased by 78% from 1976 to 1988. Between 1976 and 1988, the number of traditional students (age 18 and under) enrolling at GCC decreased from 17.8% to 12.6%. Indeed, the median student age in 1988 was 24, with nearly 40% of the student body in the 21-30 age bracket. A 1988 survey showed that 46% of the student body worked more than 30 hours per week; only 21% were not employed. These figures are not unique to GCC; rather they indicate a major state-wide shift in community college student ethnicity, age, gender, employment, and preparation that is severely affecting biological and physical science programs and courses across the curriculum.

GCC is currently developing a College Access Program, through a Title III federal grant, that will address student reading, composition, and mathematics deficiencies. Once students qualify for general education courses, much more emphasis on science education is needed to attract and retain underrepresented clientele. The GCC-UCLA California Science Consortium will use model programs from GCC and other community colleges in the state to develop and disseminate innovative teaching strategies.

Problem 2: How can community colleges develop and share strategies for nontraditional forms of instruction that provide student access to traditional science education, maintain the quality of majors programs, and stimulate interest in science transfer programs?

Increasing class sizes and teaching loads, as well as equipment budgets that barely keep up with inflation, reflect lack of commitment by the educational establishment to scientific advancement and to amelioration of declining student ability in basic skills needed for success in the science curriculum. With fewer and fewer students able to fulfill even the minimum general education requirements in science, majors courses in many community colleges are declining in enrollment and transfer programs suffer because fewer students seek careers in science. The result is that academic funding and facilities, based upon formulas tied to student enrollments, are cut and many community colleges are unable to offer satisfactory majors programs. A 1986 National Science Board report, Undergraduate Science, Mathematics and Engineering Education, said of the general level science courses offered in the first two years of college: “Too often, it seems, these special course are watered-down non-mathematical
versions of the standard introductory courses for science students; some have a strong 'applied' or 'environmental' orientation, and some focus narrowly on selected topics such as kitchen chemistry, physics for airline passengers, or biology for the home gardener. All of these attempts, in the views of their critics, fail what ought to be their central objective, to illustrate the nature of science and scientific thought; they overemphasize facts, under-emphasize process and methods, and avoid abstraction." Although some community colleges have adopted these tactics to satisfy requirements of specific transfer institutions or to stimulate interest in the sciences, GCC has retained traditional courses required for majors.

GCC's increase in traditional science transfer students over the past ten years can be attributed to clarifying and improving articulation agreements, strengthening prerequisites, maintaining standards, and offering nontraditional forms of student assistance to make them attainable. In biology, for example, students are required to complete a year of chemistry before admission to the majors program; thus, they are primed for success in a very difficult and demanding curriculum. In addition, the biology faculty offers academic advisement to supplement regular counseling and offers innovative means of helping students grasp or improve knowledge of particular courses of study. For the past twelve years, natural science faculty have presented an annual Science Lecture Series that addresses specific areas of research undertaken by instructors in the course of their teaching activities. These lectures are presented specifically to enrich the curriculum and are open to all staff, students, and members of the community free of charge. Physical science faculty already participate in the Southern California Alliance for Chemistry, Biochemistry, and Engineering, sponsored by the UCLA Center for Academic Inter-institutional Programs. Through a statewide network developed by the California Science Consortium, students will have opportunities to understand the continuity of and increasing complexity of science education, to develop a sense of collegiality and community with peers, and to enjoy more faculty support before and after transfer.

Problem 3: How can community colleges establish ties that will provide means for their science faculty to engage in research projects that will enhance and enrich classroom teaching and for their students to participate in bridge programs to ease the transition to university life?

Faculty members' teaching loads average 15 hours per week, which leaves little time to pursue research and development activities that could markedly improve teaching. Further, research activities provide important interactions with members of the science community, including peer review of projects and vital exchanges of information. The paucity of resources for instructional programs and faculty research results in the deterioration of science education and waning of student interest.

Through its staff development program, GCC has taken measures to revitalize faculty. One activity is through district-funded grant support for Innovative Projects to develop new modes of instruction, semester-long Scholarly Research Grants, and Summer Stipends for intensive study or travel to collections. These grants offer stipends not to exceed 48 hours of instructor pay or one course released for one semester. Physics awards have supported investigation of computer use for classroom applications, development of instructional videotapes, and integration of data acquisition on existing campus computers. An especially provocative grant
project researched hoaxes--or embarrassing moments--in science, concentrating on the cold fusion fever. One chemistry award funded a team activity of the entire chemistry faculty to prepare new chemistry experiments and demonstrate their use in college classes and in outreach programs at local high schools. Another provided the time to research the quantitative estimation of the destabilization of molecules due to the presence of formal charge. A biology award funded a summer project in marine ecology that focused on sampling of dense "turfs" or mats of intertidal red algae to examine the associated invertebrate assemblages. These data were then used in classroom lectures and laboratories to support student experiments. An astronomy project developed supplementary computer programs that vividly simulate sky motions and allow students to grasp information about observing locations, directions to be viewed, and observing times.

These grants encourage study related to teaching responsibilities and stimulate publication and peer review. Fully half of the summer stipends have been awarded to science faculty. Both scholarly research grants and summer stipends are highly competitive and are open to all salaried full- or part-time members of the GCC teaching staff and are described in the Journal of College Science Teaching article "Community College Research: A Creative Approach to Enhancing Instruction," attached as Appendix I. Although these limited research activities are extremely useful, community college faculty need to show their students the importance of involvement in broad-based university research projects.

Students could benefit immensely from other special programs that linked community college and UC science instruction, provided counseling or tutoring, and offered possibilities for advanced study prior to matriculation. Such programs would provide a support system that would be especially helpful in encouraging students from underrepresented groups to pursue their goals.

Problem 4: How can community colleges recruit science majors as Suture science faculty? Faculty retirements, which are increasing faster that the production of highly qualified teachers, will result in a shortage of community college science instructors that is expected to reach its peak between 1995 and 2010. One reason is the time needed to complete a scientific education to qualify for a teaching position--approximately nine years from freshman to Ph.D. If intense action were taken now, shortages would still be apparent in the mid 90s. In addition, the community colleges are especially sensitive to the need for adequate faculty representation of student populations in relation to ethnicity, race, and gender.

To ensure that future science faculty reflect the multi-ethnic and gender makeup of the student body, community colleges need to provide special counseling for early identification of majors. Faculty members could then mentor students who showed promise. Because of the shortages of qualified science instructors to serve as models, the community colleges must try to recruit potential candidates and help to educate them for transfer. As an example, at GCC the composition of 162 full-time instructors in all disciplines is 70 (43.2%) female, 8 (4.9490) Asian, 4 (2.47%) black, and 4 (2.46%) Latino. The full-time biology faculty of 6, includes 2 (33.3%) women, one (16.6%) of whom is Asian; the full-time physical science faculty of 12
includes 2 (16.6%) women, one (8.3%) of whom is black. Figures 1 and 4 show the changes in enrollment by ethnicity and gender.

Problem 5: How can community colleges offer subject-area intensive (biological and physical sciences) faculty development activities that interrelates science instruction throughout the state?

If California is to participate in the improvement of the sciences in higher education, several changes will be necessary at the two-year level. Primary among these is the continued (and constant) renewal of faculty interest. Staff development activities are among the most important aspects of a commitment to change. In the community colleges, the system of teaching is labor intensive; yet, the faculty are expected to be the true agents of change, growth, and improvement. With the exception of state-level activities, such as the annual interdisciplinary Great Teachers Seminar, most science instructors have almost no contact with peers at other institutions. As evidence of this habitual insularity, three years ago the GCC Staff Development Program tried to underwrite a series of professional meetings hosted by GCC faculty from various disciplines for community college peers and, separately, for secondary school partners, there was simply no interest. A central component of faculty development must be the recognition that the two-year instructor is not isolated from his/her peers either in other community colleges or in the university. Connections between the segments will foster advanced pedagogy, improved articulation, and better understanding of student preparation. Interaction within the segments will enhance the exchange of exciting and innovative teaching methods. Developing a Science Partnership will highlight the most individual and effective science programs and will promote complementarity of methods so that all who participate will benefit.
3. Population To Be Served

Population Served
The project is expected to benefit biological and physical science students and faculty in all 106 California community colleges, to improve the transfer rate of underrepresented students, and, ultimately, to improve the hiring rate for minorities and women.
4. Objectives

Objectives

Objective 1. Discover and evaluate strategies that address special learning needs of educationally disadvantaged students and provide access and educational services for new clientele including minorities, women, and older, working adults.

Objective 2. Identify and share exemplary strategies used to improve quality in community college science transfer education, including non-traditional form of instruction, that improve student access to and stimulate student interest in science transfer programs.

Objective 3. Encourage faculty research at the community college level, and establish ties for intersegmental bridge and research programs.

Objective 4. Examine methods for recruiting science majors as future faculty, and make recommendations for future human resources development in terms of staffing, diversity, and quality.

Objective 5. Provide subject area intensive faculty development by sponsoring a two-day conference to demonstrate, discuss, and evaluate model teaching strategies and techniques, and to establish follow-on activities.
5. Workplan Narrative

Work Statement [ORIGINAL]
The five problems shown above can be ameliorated by the development of a network designed to keep science faculty abreast of the latest in teaching techniques, laboratory facilities, and curricular needs of the students to prepare them for senior institutions and, ultimately, the work place. This proposal would establish such a system. When implemented, the California Science Consortium will link the UC system and dozens of community colleges through an organization benefiting students, faculty, and institutions.

Based on the GCC-UCLA model, the California Science Consortium will establish state-wide UC and community college partnerships to strengthen inter- and intra-segmental faculty relationships through special staff development programs and seminars.

[SEE PRINT DOCUMENT FOR “REVISION” WHICH SHOWS DETAILS—TIMELINES BUDGETS.]

Personnel
Curriculum Vitae for project personnel listed below are included in Appendix 2.

Glendale Community College

Sharon D. Scull, Project Supervisor, is the Staff Development Officer and also coordinates and interactively team teaches in the Interdisciplinary Humanities Program. She is an Associate Professor of English. She created and developed and manages the comprehensive, innovative GCC model staff development program for faculty, administrators, and classified staff.

Larry R. Byrd, Project Co-director, is a Professor of Chemistry. He serves as a member of the Staff Development Advisory Subcommittee and is a participant in the UCLA-sponsored Alliance for Chemistry, Biochemistry, and Engineering

Ronald K. Harlan, Project Co-director, is an Associate Professor of Biology. He is responsible for the biology majors program and has also taught a wide variety of courses for non-science majors. He has broad experience with nontraditional students and cultural diversity.
University of California, Los Angeles

Leslie Koltai, Project Coordinator at UCLA, is an Adjunct Professor in the Graduate School of Education at UCLA and the Chancellor Emeritus of the Los Angeles Community Colleges. He has served as a staff development consultant and is the Project Director of the National Science Foundation Community College Science Project.

Michael Wilding, Project Research Investigator at UCLA, is a Research Associate in the UCLA Graduate School of Education and a faculty member at California State University, Northridge in the areas of program planning, environmental education, and human development.

Equipment

UCLA has agreed to supply any laboratory space and any equipment needed for demonstrations of the ten exemplary programs. No equipment purchases are planned.

Materials

The project will purchase incidental materials needed for demonstrations of the ten exemplary programs if presenters are unable to supply them. Otherwise, printed materials will be the major expenditure in the 4590 category.

Evaluation Process

Evaluation of each stage of the project will be used to shape the next phase. Evaluation of the community college and UC complementary surveys will determine how to proceed in the development of the partnership agreement. Evaluation of the exemplary programs from the 106 community colleges will determine the format of the March conference. Evaluation of overall conference will influence the development of the follow-on bridge and shared research programs. Evaluations of findings will be made at dissemination conferences to determine statewide usefulness of the project.
6. Expected Outcomes

Expected Outcomes of Project Activities

Fulfilment of Project Objectives

Objective 1. Planning, conducting, and evaluating the complementary community college-UC survey will discover strategies that address special learning needs of educationally disadvantaged students and provide access and educational services for new clientele including minorities, women, and older, working adults.

Objective 2. Analysis of survey data and selection of the ten most innovative community college science programs by the GCC biological and physical science faculty and the project staff will identify and set the stage to share exemplary strategies used to improve quality in community college transfer education, including nontraditional forms of instruction, that improve student access to and stimulate student interest in science transfer programs. The GCC Science, Technology, and Ethics Lecture Series will serve as a model program to interest faculty, students, and the community in science education.

Objective 3. Distribution of the community college-UC survey results will promote better inter- and intra-segmental understanding, as will the state-wide conference held at UCLA. Planning activities will further cement the GCC-UCLA bond. Evaluation of the conference and the exemplary presentations by participants will strengthen their sense of involvement. The GCC scholarly research grants will serve as a model to encourage faculty research at the community college level. All activities in this objective will help to establish ties for follow-on intersegmental bridge and research programs.

Objective 4. The state-wide conference will examine the intricacies of techniques to ensure that race, gender, and ethnicity are appropriately represented in the curriculum and in the teaching faculty, and participants will examine methods for recruiting science majors as future faculty, as well as making recommendations for future human resources development in terms of staffing, diversity, and quality.

Objective 5. The conference will model integrative, subject-area intensive staff development training by providing exchange of information on successful forms of instruction that address the problems identified in this proposal. Representatives from the UC system will be invited to initiate the partnership arrangement and provide the basis for follow-on activities.

Impact of the Project

The project will involve the biological and physical science faculty of all 106 California community colleges and all UC campuses in an effort to improve transfer education, provide underrepresented students with access to majors programs, and establish means of involving
community college faculty with meaningful university research possibilities that could serve as models for students and improve lower division education. The project will establish the foundation for summer and other bridge programs that will help students with the transition to the university curriculum.

Potential for Continued Support

Once the community college-UC partnership is established, it should continue indefinitely and should have the full support of all members of both segments, especially if the follow-on bridge and faculty research programs are developed. The only major future funding required to maximize participation will be for an annual state-wide conference. Those expenses can be shared among the participants. With that exception, the partnership program should be self sustaining

Potential for Adaptation to Other Programs

This partnership project can be applied to any community college-UC transfer discipline in the curriculum.
7. Evaluation Plan

Evaluation Plan

Ongoing evaluation will be carried on throughout the project to aid in planning both partnership and conference activities. Major milestones are:

- **October**: Evaluation of community college-UC complementary surveys
- **December**: Evaluation of exemplary model programs
- **March**: Participants' evaluation of conference and exemplary programs
- **March**: Project staff's evaluation of conference and participants' responses
- **April-June**: Project staff's evaluation of project for final report
Dissemination Plan

The following materials will be disseminated state-wide to participants, presidents, chief instruction officers, and natural science departments in the community college and UC systems: (1) results of surveys and evaluations; (2) conference proceedings; (3) description of exemplary programs; and (4) a directory of natural science partnership members. To publicize the partnerships and the project itself, project personnel will propose interactive and individual presentations at state and national professional societies and organizations that represent staff development and instructional interests; for example, the California Community College Consortium of Staff Developers (4C/SD); National Institute for Staff and Organizational Development (NISOD); National Council for Staff, Program, and Organizational Development (NCSPOD); California Association of Community Colleges (CACC); and Association of California Community College Administrators (ACCCA). In addition, the project team will submit articles about the project, the partnership, and the proposed follow-on bridge and research programs to various state and national publications and in-house newsletters. The conference proceedings and the final report to the Chancellor's Office will be submitted to ERIC. Finally, the team will offer workshops publicize the California Science Consortium.
9. Budget Narrative

[NO “BUDGET NARRATIVE” ACCOMPANIES THIS DOCUMENT.]